WE CLAIM:

1. In a method of monitoring an electric arc having an arc signature typefied by a wideband range of frequencies of a chaotic nature in a monitored circuit,
the improvement comprising in combination:
selecting a fractal subset of said arc signature characterized by relatively long travel along said monitored circuit and low cross-induction among neighboring circuits; and
monitoring said electric arc from said fractal subset of said arc signature.

2. A method as in a claim 1,
wherein:
said fractal subset is selected from a logarithmic decade of said wideband range of frequencies.

3. A method as in claim 1,
wherein:
said fraction covers at least a quarter of a logarithmic decade of said wideband range of frequencies of the electric arc.

4. A method as in claim 1,
wherein:
said fractal subset is selected from a frequency band below 30 kHz.

5. A method as in claim 1,
wherein:
said selection of a fractal subset is restricted in frequency to the ELF (extremely low frequency) band.

6. A method as in claim 1,
wherein:
said selection of a fractal subset is restricted in frequency to below the vf (voice frequency) band.

7. A method as in claim 1,
wherein:
said fractal subset is selected below a first harmonic of a standard line frequency in alternating-current power supply systems.

8. A method as in claim 1,
wherein:
said fractal subset is selected from a frequency band on the order of a standard line frequency in alternating-current power supply systems.

9. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8,
wherein:
narrow-band extraneous signals in said fractal subset of said arc signature are diminished in energy relative to a remainder of said fractal subset before detection of said electric arc from said fractal subset.

10. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8,
wherein:
said fractal subset is subjected to a frequency transformation; and
said electric arc is detected from said fractal subset after said frequency transformation.

11. A method as in claim 10,
wherein:
said fractal subset is added to itself; and
said electric arc is detected from the fractal subset added to itself.

12. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, wherein:

said fractal subset is processed in two paths out of phase with each other; and

said electric arc is monitored from the fractal subset processed in said two paths out of phase with each other.

13. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, wherein:

said fractal subset is treated as a modulated carrier having a modulation indicative of said electric arc; and

said electric arc is monitored by monitoring a modulation of said modulated carrier.

14. A method as in claim 13, wherein:

said fractal subset is treated as an amplitude-modulated carrier; and

said electric arc is monitored by monitoring a modulation of said amplitude-modulated carrier.

15. A method as in claim 14, wherein:

said electric arc is monitored by recovering the modulation on said amplitude-modulated carrier, and by then detecting the amplitude from the recovered modulation.

16. A method as in claim 13, wherein:

said fractal subset is treated as a frequency-modulated carrier; and

said electric arc is monitored by monitoring a modulation of said frequency-modulated carrier.

17. A method as in claim 13, wherein:

said fractal subset is treated as a carrier modulated both in a first manner and in a different second manner; and

said electric arc is monitored by monitoring first and second modulations of said carrier modulated both in said first manner and in said second manner.

18. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, including:

providing a prewarning of a possible electric arc.

19. A method as in claim 16, wherein:

said prewarning is provided in stages.

20. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, including:

displaying an occurrence of signals having frequencies in a bandwidth of said fractal subset.

21. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, including:

displaying an occurrence of wideband signals in a bandwidth of said fractal subset.

22. A method as in claim 1, 2, 3, 4, 5, 6, 7 or 8, including:

displaying an occurrence of a chaotic wideband signal in a bandwidth of said fractal subset.

23. In a method of monitoring an electric arc having an arc signature extending over a wideband range of frequencies of a chaotic nature in a monitored circuit, the improvement comprising in combination:

processing portions of said arc signature in two paths out of phase with each other; and

monitoring said electric arc from said out of phase portions of said arc signature.

24. In a method of monitoring an electric arc having an arc signature extending over a wideband range of frequencies of a chaotic nature in a monitored circuit, the improvement comprising in combination:

treating said arc signature as a modulated carrier having a modulation indicative of said electric arc; and

monitoring said electric arc by monitoring a modulation of said modulated carrier.

25. A method as in claim 24, wherein:

said arc signature is treated as an amplitude-modulated carrier; and

said electric arc is monitored by monitoring a modulation of said amplitude-modulated carrier.

26. A method as in claim 25, wherein:

said electric arc is monitored by recovering the modulation on said amplitude-modulated carrier, and by then detecting the amplitude from the recovered modulation.

27. A method as in claim 24, wherein:

said arc signature is treated as a frequency-modulated carrier; and

said electric arc is monitored by monitoring a modulation of said frequency-modulated carrier.

28. A method as in claim 24,
wherein:
said arc signature is treated as a carrier modulated both in a first manner and in a different second manner; and
said electric arc is monitored by monitoring first and second modulations of said carrier modulated both in said first manner and in said second manner.

29. In apparatus for monitoring an electric arc having an arc signature typified by a wideband range of frequencies of a chaotic nature in a monitored circuit,
the improvement comprising in combination:
an electric filter having an input coupled to said arc, having a passband corresponding to a fractal subset of said arc signature characterized by relatively long travel along said monitored circuit and low cross-induction among neighboring circuits, and having an output for said fractal subset of arc signature; and
a chaotic wideband signal detector having a detector input for said fractal subset of said arc signature coupled to said output of the electric filter.

30. Apparatus as in claim 29,
wherein:
said passband is in a logarithmic decade of said wideband range of frequencies.

31. Apparatus as in claim 29,
wherein:
said passband is below 30 kHz.

32. Apparatus as in claim 29,
wherein:
said passband is where there are less extraneous signals than in a remainder of said wideband range of frequencies.

33. Apparatus as in claim 29, wherein:
said passband is in the ELF (extremely low frequency) band.

34. Apparatus as in claim 29, wherein:
said passband is below the vf (voice frequency) band.

35. Apparatus as in claim 29, wherein:
said passband is below a first harmonic of a standard line frequency in alternating-current power supply systems.

36. Apparatus as in claim 29, wherein:
said passband is on the order of a standard line frequency in alternating-current power supply systems.

37. Apparatus as in claim 29, wherein:
said passband covers at least a quarter of a logarithmic decade of said wideband range of frequencies of the electric arc.

38. Apparatus as in claim 29, wherein:
said passband covers not more than a logarithmic decade of said wideband range of frequencies of the electric arc.

39. Apparatus as in claim 29, including:

an inverting amplifier having an input connected to said output of said electric filter, and having an amplifier output connected to said detector input; and

a non-inverting amplifier having an input connected to said output of said electric filter, and having an amplifier output connected to said detector input.

40. Apparatus as in claim 29, wherein:

said chaotic wideband signal detector includes a modulated carrier detector coupled to said output of the electric filter.

41. Apparatus as in claim 40, wherein:

said modulated carrier detector is an AM detector.

42. Apparatus as in claim 40, wherein:

said modulated carrier detector is an FM detector.

43. Apparatus as in claim 40, wherein:

said chaotic wideband detector includes combined modulated carrier detectors.

44. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43, including:

an energy converter having a converter input for said fractal subset and for narrow-band extraneous signals in said arc signature segment coupled to said output of the electric filter, and having a converter output for said arc signature segment and for narrow-band extraneous signals of diminished energy relative to the fractal subset and being connected to said chaotic wideband signal detector.

45. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43, including:

a frequency converter having a converter input for said fractal subset coupled to said output of the electric filter circuitry, and having a converter output for said fractal subset in a frequency band distinct from said passband and being connected to said chaotic wideband signal detector.

46. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43, including:

a frequency converter having two converter inputs for said fractal subset coupled to said output of the electric filter, and having a converter output for said fractal subset in a frequency band double the frequency band of said fractal subset as the distinct frequency band of said arc signal and being connected to said chaotic wideband signal detector.

47. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43,
including:
a modulator having a modulator input for said fractal subset coupled to said output of the electric filter, and having a modulator output for a modulated carrier having a modulation indicative of said electric arc connected to said chaotic wideband signal detector;
said chaotic wideband signal detector including a modulation detector.

48. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43,
including:
a modulator having a modulator input for said fractal subset coupled to said output of the electric filter, and having a modulator output for an amplitude-modulated carrier having an amplitude modulation indicative of said electric arc connected to said chaotic wideband signal detector;
said chaotic wideband signal detector including an amplitude-modulation detector.

49. Apparatus as in claim 48,
wherein:
said amplitude-modulation detector includes a first stage recovering the modulation on said amplitude-modulated carrier, and a second stage detecting from the recovered modulation an amplitude indicative of said arc signature.

50. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43,
including:
an electric arc prewarning indicator coupled to said electric filter.

51. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43, including:

an electric arc prewarning indicator coupled to said chaotic wideband signal detector.

52. Apparatus as in claim 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42 or 43, including:

a wideband signal indicator coupled to said chaotic wideband signal detector.

53. Apparatus as in claim 52, wherein:

said indicator is a wideband chaotic signal indicator coupled to said chaotic wideband signal detector.

54. In apparatus for monitoring an electric arc having an arc signature typified by a wideband range of frequencies of a chaotic nature in a monitored circuit, the improvement comprising in combination:

an electric filter having an input coupled to said arc, having a passband corresponding to portions of said arc signature, and having an output for said portions of arc signature;

an inverting amplifier having an input connected to said output of said electric filter, and having an amplifier output;

a non-inverting amplifier having an input connected to said output of said electric filter, having an amplifier output, and being in parallel to said inverting amplifier; and

a chaotic wideband signal detector having a detector input coupled to said amplifier outputs of said inverting and non-inverting amplifiers.

55. In apparatus for monitoring an electric arc having an arc signature typified by a wideband range of frequencies of a chaotic nature in a monitored circuit, the improvement comprising in combination:
a modulated carrier detector having an arc signature input and a carrier modulation output.

56. Apparatus as in claim 55, wherein:
said modulated carrier detector is an AM detector.

57. Apparatus as in claim 55, wherein:
said modulated carrier detector is an FM detector.

58. In apparatus for monitoring an electric arc having an arc signature typified by a wideband range of frequencies of a chaotic nature in a monitored circuit, the improvement comprising in combination:
combined modulated carrier detectors having arc signature inputs and a combined carrier modulation output.

59. Apparatus as in claim 58, wherein:
said combined modulated carrier detectors are like kind modulated carrier detectors.

60. Apparatus as in claim 59, wherein:
said like kind modulated carrier detectors are series connected.

61. Apparatus as in claim 59, wherein:
said like kind modulated carrier detectors are parallel connected.

62. Apparatus as in claim 58, wherein:

said combined modulated carrier detectors include different kinds of modulated carrier detectors.

63. Apparatus as in claim 62, wherein:

said different kinds of modulated carrier detectors include an AM detector and an FM detector.

64. Apparatus as in claim 63, wherein:

said AM detector and FM detector are connected in parallel.

65. Apparatus as in claim 64, including:

an AND-element having inputs connected to said AM detector and said FM detector, and having an output as said combined carrier modulation output.

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66. A method of monitoring occurrence of sparks aboard aircraft, comprising in combination:

continually monitoring an occurrence of sparks at a first location aboard the aircraft;

continually monitoring an occurrence of sparks at a second location aboard the aircraft distant from said first location; and

establishing in response to said monitoring a record of sparks occurring at said first location and a record of sparks occurring at said distant second location aboard the aircraft.

67. A method as in claim 66, including:

continually monitoring an occurrence of sparks at a third location aboard the aircraft distant from said first and second locations; and

establishing said record as a record of sparks occurring at said first location, a record of sparks occurring at said second location, and a record of sparks occurring at said third location aboard the aircraft.

68. A method as in claim 66 or 67, wherein:

said record is established on a chart.

69. A method as in claim 66 or 67, wherein:

said monitoring covers an entire flight of said aircraft; and

said record is inspected after said flight.

70. A method as in claim 66 or 67, wherein:

said monitoring covers substantially all flights of said aircraft over a maintenance interval; and

said record is made available to maintenance personnel.

71. A method as claimed in claim 66 or 67, wherein:

an alarm condition is established in response to occurrence of sparks at at least one of said locations.

72. A method as in claim 71, wherein:

said alarm condition is established during a flight of said aircraft.

73. A method as in claim 71, wherein:
said alarm condition is established at the end of a flight of said aircraft.

74. A method as in claim 66 or 67, wherein:
said sparks are electric arcs;
arc signatures of said electric arcs are processed in two paths out of phase with each other; and
occurrence of electric arcs is continually monitored from said out of phase portions of said arc signature.

75. A method as in claim 66 or 67, wherein:
said sparks are electric arcs;
arc signatures of said electric arcs are treated as a modulated carrier having a modulation indicative of said electric arc; and
occurrence of electric arcs is continuously monitored by monitoring a modulation of said modulated carrier.

76. A method as claimed in claim 66 or 67, wherein:
said sparks are electric arcs;
said electric arcs are monitored by monitoring a fractal subset of arc signatures of said electric arcs.

77. A spark monitoring system aboard aircraft, comprising in combination:
a spark monitor at a first location aboard the aircraft, having a first spark signal output;
an spark monitor at a second location aboard the aircraft distant from said first location, having a second spark signal output; and
a spark signal recorder connected to said first and second spark signal outputs.

78. A system as in claim 77, including:

a spark monitor at a third location aboard the aircraft distant from said first and second locations, having a third spark signal output connected to said spark signal recorder.

79. A system as in claim 77 or 78, wherein:

said record is a chart recorder.

80. A system as claimed in claim 77 or 78, including:

an alarm device connected to at least one of said spark signal outputs.

81. A system as in claim 77 or 78, including:

electric arc monitors as said spark monitors;

an electric filter in at least one of said electric arc monitors, having a passband corresponding to a fractal subset of said arc signature, and having an output for said fractal subset of arc signature; and

a chaotic wideband signal detector having a detector input for said fractal subset of said arc signature coupled to said output of the electric filter.

82. A system as in claim 77 or 78, including:

electric arc monitors as said spark monitors;

an electric filter in at least one of said electric arc monitors, having a passband corresponding to portions of a signature of a monitored arc, and having an output for said portions of arc signature;

an inverting amplifier having an input connected to said output of said electric filter, and having an amplifier output;

a non-inverting amplifier having an input connected to said output of said electric filter, having an amplifier output, and being in parallel to said inverting amplifier; and

a chaotic wideband signal detector having a detector input coupled to said amplifier outputs of said inverting and non-inverting amplifiers.

83. A system as in claim 77 or 78, for monitoring an electric arc having an arc signature typified by a wideband range of frequencies of a chaotic nature in at least one of said electric arc monitors, the improvement comprising in combination:

a modulated carrier detector having an arc signature input and a carrier modulation output.